भारतीय मानक
Indian Standard

IS 16351 : 2015
(Reaffirmed 2019)

भूकृत्रिम — भूकृत्रिम के तरल पदार्थ के प्रति रासायनिक प्रतिरोध के मूल्यांकन के लिए प्रयोगशाला विसर्जन प्रक्रियाओं की मानक प्रथा

Geosynthetics — Standard Practice for Laboratory Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids

ICS 59.080.70

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भारतीय मानक ब्यूरो
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July 2015 **Price Group 3**

Geosynthetics Sectional Committee, TXD 30

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Geosynthetics Sectional Committee had been approved by the Textile Division Council.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

GEOSYNTHETICS — STANDARD PRACTICE FOR LABORATORY IMMERSION PROCEDURES FOR EVALUATING THE CHEMICAL RESISTANCE OF GEOSYNTHETICS TO LIQUIDS

1 SCOPE

This standard covers laboratory immersion procedures for the testing of geosynthetics for chemical resistance to liquid wastes, prepared chemical solutions, and leachates derived from solid wastes.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

IS No.	*Title*
13321 (Part 1) : 1992	Glossary of terms for geosynthetics: Part 1 Terms used in materials and properties.
SP 45 : 2014	Handbook on glossary of textile terms

3 TERMINOLOGY

For the purpose of this standard, the definitions those given in SP 45 and IS13321 (Part 1) shall apply.

4 PRINCIPLE

Geosynthetic material is used widely for many geotechnical, environmental applications where it is subjected to harsh environmental condition and it comes in contact with the hazardous liquids which contain chemicals that can hamper the properties of geosynthetic material. In view of this, test describes the method to find out the resistance of geosynthetic material to the liquid wastes, prepared chemical solutions, and leachates derived from solid wastes.

5 APPARATUS

5.1 Exposure Tank, for containment of the solution and test material. The tank shall be chemically resistant and impermeable to the solution being used. Stainless steel or glass is recommended. Glass should not be used with strongly basic solutions.

5.2. Exposure Tank Lid, for sealing the tank. In order to prevent the loss of volatile components of interest, the tank shall be capable of being sealed with a chemically resistant material.

5.3 Unless otherwise specified, agreed upon, or required, provisions shall be made for maintaining ambient atmospheric pressure in the tank. Using a reflex condenser open to the air, a pressure relief valve or any method allowing the movement of gas to relieve pressure while minimizing changes in the chemical composition of the test solution is acceptable. The purpose of this feature of the equipment is to prevent pressure build-up in an exposure tank from the generation of gases by chemical reactions or biological activity.

5.4 Pressurized tanks that maintain a constant pressure may be used as an alternative to **5.3** when the maintenance of a pressure other than ambient atmospheric pressure is specified, agreed upon, or required.

5.5 Temperature Control Equipment, to maintain the immersion solution at the specified temperature. Options that have worked well are the following: (a) a hot water bath to contain the exposure tank; (b) a heating coil wrapped around the tank, or a hot plate used in conjunction with a thermostat and thermocouple; and (c) a room controlled at the exposure temperature for storing the tank. Placing a heating coil directly in the exposure solution is not recommended since corrosion may affect the coil, and chemical reactions that may not otherwise occur may occur on a hot coil.

5.6 Stirrer, if required, for mixing the solution. Magnetically moved stirring bars and mechanical stirrers entering the tank through the lid will both work, depending on the temperature control procedure.

6 REAGENTS AND MATERIALS

6.1 Immersion Solution — The solutions potentially used with this practice have large differences in origin. The user of this standard shall determine the correct solution for use in the particular application. Liquid wastes, leachates collected from existing installations, leachates made from solid wastes, synthetic leachates made from laboratory chemicals, standard chemical solutions, and reference fuels and oils are some of the possibilities.

7 PREPARATION OF TEST SPECIMEN

7.1 Samples of the geosynthetic(s) to be immersed should be taken in a manner appropriate for the particular material. It is essential that all of the material immersed, as well as the unexposed material to be tested, have physical properties that are as similar as possible. Refer to the section on sampling in the applicable standard for the chemical resistance of the specific geosynthetic to be tested.

8 PROCEDURE

8.1 Tank Preparation

Clean the tank and lid thoroughly prior to introduction of the sample or liquid. Use distilled or deionized water for the final rinse of the cleaning procedure.

8.2 Sample Exposure

Hold the geosynthetic material to be immersed in place in the exposure container in such a way that contact with the container and other sheets of material is limited as much as possible.

8.2.1 Do not immerse different types of geosynthetic materials in the same immersion vessel.

8.2.2 Add the liquid to the tank with the test samples in place. The liquid shall cover the samples completely.

8.2.3 If the liquid is placed in the tank at ambient temperature and heated subsequently to an elevated immersion temperature, the liquid will expand to a greater volume. This can result in the volume of the liquid exceeding the capacity of the tank and thus a spill of hazardous materials. Expansion of the liquid should be anticipated and procedures prepared for the containment of excess liquid.

8.3 Sealing the Tanks

Unless otherwise specified, agreed upon, or required, seal the exposure tanks with no air if the solution contains volatile organics or if the solution to be in contact with the geosynthetic will exist in the field under buried conditions. The pressure inside the tank shall be the same as that outside the tank.

8.4 Do not seal the exposure tanks and leave an air space equal to 10 ± 2 percent of the volume of the exposure tank if there are no volatile organics in the solution and the geosynthetic will be used under free air exchange conditions in the field. If the tank is not sealed, the solution shall be monitored closely for volume changes due to evaporation or water absorption. Evaporation shall be minimized as much as possible. Replace evaporated water with distilled or deionized water. Keep a record of the volume of water added and the date water was added. If the solution picks up moisture, store the tank in a low-humidity environment to eliminate the problem.

8.5 Stirring the Solution

Stirring the immersion liquid is required unless evidence can be offered that stirring is not necessary to maintain a homogeneous solution. By keeping the solution circulating slowly, fresh solution is constantly passing over the surface of the geosynthetic, thereby preventing a stagnant layer of reacted or used liquid from existing around the geosynthetic and thus stratification or settling of chemical constituents.

8.5.1 If the immersion liquid consists of two separate immiscible liquids, and if the volume of the lesser of the two liquids constitutes a significant portion of the solution (greater than 1 percent), two separate immersions should be conducted with the two liquids, if it is possible to collect enough of the lesser solution to perform the immersion.

8.6 Immersion Temperatures

Recommended standard temperatures are 27°C and 50°C. Higher temperatures may affect the synthetic material adversely in a manner that would not occur at the lower temperatures. Immersion at temperatures above 50°C is not recommended unless the material is to be used at higher temperatures. Maintain the temperature of the exposure tanks within 2°C of the selected immersion temperature.

8.7 Test Period Selection

In addition to testing the unexposed geosynthetic material, conduct testing after four immersion periods. Immerse sufficient material for the planned immersion periods plus two additional periods. Testing after more than four periods may be necessary, if warranted by changes observed in the material, or if additional data are necessary due to erratic or inconclusive results.

8.8 In the absence of other specifications or user requirements, the standard immersion periods are 1, 2, 3, and 4 months.

8.9 Maintaining Solution Chemistry

If it is suspected that trace amounts of chemicals may be depleted from the liquid, or that the chemical nature of the liquid changes with time, it is recommended that the immersion liquid be replaced with fresh solution after each test period. If the liquid is to be replaced periodically, it is important that the fresh liquid be from the same source as the original liquid and that the fresh liquid be as similar to the original liquid as possible.

9 REPORT

The report shall include the following:

a) State that the tests were performed as directed in this test method. Describe the material(s) or products(s) sampled and the method of sampling used.

b) Report the following information for each sample:

   1) Description of the origin and chemical character of the immersion liquid.
   2) Results of the centrifuging, if performed.
   3) Composition of the tanks and lids.
   4) Manner in which the tanks were sealed (tightly or not).
   5) If the tanks were not sealed, a record of the level of the liquids and any water or chemical additions.
   6) Whether the liquid was changed after each test period. If not, the basis of the decision.
   7) If the liquids were stirred, approximate speed and size of the stirring device.
   8) Immersion temperatures.
   9) Whether an unacceptable deviation from the allowed temperature range occurred.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Geosynthetics Sectional Committee, TX 30

Organization	*Representative(s)*
The Bombay Textile Research Association, Mumbai	Dr A. N. Desai (***Chairman***) Shri V. K. Patil (*Alternate*)
Business Coordination House, New Delhi	Shri Samir Gupta Shrimati Ritika Gupta (*Alternate*)
Central Road Research Institute, New Delhi	Shri Sudhir Mathur Shri Jai Bahagwan (*Alternate*)
Central Soil and Materials Research Station, New Delhi	Shri Nripendra Kumar Shri Manish Gupta (*Alternate*)
CIDCO, Mumbai	Representative
Coir Board, Kochi	Dr U. S. Sarma Shri M. Kumaraswamy Pillay (*Alternate*)
Department of Jute and Fibre Technology, Kolkatta	Dr Swapan Ghosh Shri K. R. Gupta (*Alternate*)
Directorate General of Supplies and Disposals, New Delhi	Additional Director General (QA)
E. I. Dupont India Pvt Ltd, Gurgaon	Shri R. Ganesh Shrimati Vedika Kapoor (*Alternate*)
Ganga Flood Control Commission, Patna	Shri S. Masood Husain Shri Ravi Bhushan Kumar (*Alternate*)
Garware Wall Ropes Ltd, Pune	Shri Tirumal Kulkarni Shri S. J. Chitnis (*Alternate*)
Gujarat Engineering Research Institute, Vadodara	Shri L. V. Ashara Research Officer (*Alternate)*
Indian Jute Industries' Research Association, Kolkata	Shri P. K. Choudhury Shri Koushik Das (*Alternate*)
Indian Jute Manufacture Association, Kolkatta	Representative
Jaya Shree Textiles, Hooghly	Shri Pawan Sharma
Kusumgar Corporates, Mumbai	Shri Y. K. Kusumgar Dr M. K. Talukdar (*Alternate*)
Macaferri Environmental Solutions Pvt Ltd, Navi Mumbai	Dr Ratnakar Mahajan
Maharashtra Maritime Board, Mumbai	Representative
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Premier Polyfilms Ltd, Ghaziabad	Dr Sanjeev K. Verma Shri Harinder Kumar (*Alternate*)
Reliance Industries Ltd, New Delhi	Shri M. S. Verma Shri V. Ravikanth (*Alternate*)
Strata Geosystems (I) Pvt Ltd, Mumbai	Shri Narendra Dalmia Shri Shahrokh Bagli (*Alternate*)
Supreme Nonwovens Pvt Ltd, Hyderabad	Shri C. K. Chaudhuri Shri C. K. Jain (*Alternate*)
Techfab India, Mumbai	Shri Anant Kanoi Dr Saurabh Vyas (*Alternate*)

Organization	*Representative(s)*
The Synthetics & Art Silk Mills Research Association, Mumbai	Dr Manisha Mathur Shrimati Ashwini Sudam (*Alternate*)
Urja Products Pvt Ltd, Ahmedabad	Shri Janak Nanavaty
Veermata Jijabai Technological Institute, Mumbai	Shri S. P. Borkar
BIS Directorate General	Shri Prabhakar Rai, Scientist 'E' and Head (TXD) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri J. K. Gupta
Scientist 'C' (TXD), BIS

Bureau of Indian Standards

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